

**LASER RETROREFLECTOR ARRAY (LARA) FOR**  
**IRS MISSIONS**

**BY**

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### **Abstract:**

ISRO is supporting multiple satellites currently for remote sensing applications through its ground stations within and outside the country. ISRO has also plans to launch in the near future advanced remote sensing missions like Cartosat, Oceansat, Metsat etc. which require ground imagery resolution of the order of 2.5 m. It is not possible to meet this stringent requirement with the present orbit determination using RF tracking. In view of this, a task team was setup for advanced tracking systems to improve orbit accuracy and Satellite laser Ranging (SLR) was one of the recommendations by the team since SLR is the most accurate technique available for observing the orbits of the artificial satellites. Also, ISRO has initiated space geodetic activity which is a nascent field in India and to pursue this, advanced tracking techniques such as SLR, GPS, PRARE, DORIS, VLBI are required. ISRO is already operating PRARE & GPS stations and SLR will complement data for space geodesy & geo-dynamics studies. ISRO having long experience in SLR operation for more than a decade is an added advantage for this program. Hence, to enable laser ranging to a satellite, laser retro reflectors are to be fitted with the earth facing side of the satellite. This paper presents the design, and analysis of the Laser Retroreflector Array (LARA) for IRS mission. The maximum energy reaching the spacecraft as well as the ground receiver, cut off angle, LARA onboard location and other relevant analysis are also brought out.

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## **SUMMARY**

- **ISRO IS PROVIDING TTC SUPPORT TO MULTIPLE REMOTE SENSING SATELLITES USING ITS GROUND STATIONS WITHIN AND OUTSIDE INDIA**
- **ISRO IS ALSO OPERATING A PRARE STATION AND A P-CODE GPS RECEIVER AT THE SAME CAMPUS, BANGALORE**
- **ISRO HAS LONG EXPERIENCE IN OPERATING THE FIRST GENERATION LASER SYSTEM AT KAVALUR, INDIA FOR MORE THAN A DECADE**
- **ISRO CAN REVIVE SLR PROGRAMME IN INDIA AND BECOME PART OF THE GLOBAL SLR NETWORK**
- **NECESSARY INFRASTRUCTURE, EXPERTISE IN HARDWARE, SOFTWARE, ORBIT DETERMINATION ETC. ARE AVAILABLE IN ISRO**
- **ISRO HAS OPERATIONAL EXPERIENCE IN ORBIT DETERMINATION/POD FOR MORE THAN TWO DECADES.**
- **BANGALORE CAN BE ELEVATED AS ONE OF THE FUNDAMENTAL REFERENCE STATIONS FOR SPACE GEODESY**
- **ISRO CAN COLLABORATE WITH RESEARCH AND ACADEMIC INSTITUTIONS TO EVOLVE A STRONG AND VIBRANT SCIENCE GROUP**
- **ESTABLISHING SLR STATION AT BANGALORE WILL FULFIULL THE LONG STANDING GAP IN THE GLOBAL SLR NETWORK AT THE INDIAN SUB-CONTINENT**
- **ISRO HAS PROPOSAL TO CONDUCT INTERNATIONAL WORKSHOP ON SPACE GEODESY TO BRING THE EXPERTS ON A COMMON PLATFORM**
- **ISRO HAS PLANS TO FOSTERSPACE GEODESY IN INDIA BY ESTABLISHING A SPACE GEODESY CENTRE. TOWARDS THIS, A GEODESY DIVISION IS OPENED RECENTLY**
- **TO GET ACCURATE GROUND IMAGERIESFROM REMOTE SENSING SATELLITES, ISRO HAS PROPOSED TO PUT RETROREFLECTORS TO ITS FUTURE IRS MISSIONS**

- **A DETAILED INTERNAL DESIGN REPORT IS MADE IN THIS RESPECT**
- **THE RETROREFLECTOR ARRAY IS SIMILAR TO ENVISAT, 9 CUBES ON CONICAL ARRAY.**